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# AMS 321: Computer Projects in Applied Mathematics

## Midterm 2009

**Assignment Time:** Wednesday (10/21/2009) 2:20pm

**Collection Time:** Wednesday (10/21/2009) 3:40pm

**Location:** Math SINC Site (S-235C) on-machine exam

**Notes:** *(1) Open Book and Own Lecture Notes; Calculators Allowed; (2) Do Any One Of The Three Problems; You Must Mark The Problem You Attempt; (3) Each Problem Is Worth 15 Points As Indicated Points; NO Additional Points for Doing More Than One Problem*

1. Integrate the following by any two methods and one of them must be the Monte Carlo method discussed in class. In each method, you must estimate the number of floating point operations for achieving five digits of accuracy. Both methods should achieve the same result but they may have very different computing efforts. Explain why.

$$I = \int_0^{\pi} \sin(x^4) \cos(x^3) e^{-x^2} dx \int_0^{\pi} \sin(x^4) \cos(x^3) e^{-x^2} dx$$

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2. Stony Brook University has 40,000 email accounts for faculty, students and staff with each receiving between 0 and 30 useful emails each day. The number of emails received follows a truncated Normal Distribution, i.e., very few people receive 0, 1, 29, or 30 emails. Please compute:
- (1) The number of people who receive 19 and more emails
  - (2) The percentage of people who receive 15 (inclusive) and fewer emails
  - (3) The average number of emails received per email account
  - (4) The most likely number of emails received

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3. There are infinitely many infinitely long parallel lines on the floor. The distance between any two adjacent lines is “1”. You drop a stick of length “1”, randomly, to the floor 1,000,000 times. Each time, the stick either intersects a parallel line or not. During N “dropping” experiments, the stick intersects the parallel line M times. Perform numerical experiments for N=1000, 2000, 10,000, 1,000,000 to compute N/M. Present your data by the following table and plot the result N/M vs. N. Explain what and why N/M should converge to (5 points).

N	1000	2000	...	1,000,000
N/M				